OBSERVATIONS

ON SUCH

NUTRITIVE VEGETABLES

AS MAY BE SUBSTITUTED IN THE

PLACE OF

ORDINARY FOOD.

[Price 1*s.* 6*d.*]

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ON SUCH

NUTRITIVE VEGETABLES

AS MAY BE SUBSTITUTED IN THE PLACE OF

ORDINARY FOOD,

IN TIMES OF SCARCITY.

EXTRACTED FROM THE FRENCH OF

M. PARMENTIER.

Fas eſt vel ab hoſte doceri.

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MDCCLXXXIII.

PREFACE,

BY THE TRANSLATOR.

AT the preſent period of ſcarcity and dearneſs of proviſions, when the common people have been already excited to diſcontent and tumult, by the diſtreſs that has ſo ſoon begun to preſs upon them, and by the proſpect of the ſtill deeper diſtreſs in which they will probably be involved before another harveſt; and when, beſides a great army and fleet, diſtant iſlands are to be maintained out of ſtores, perhaps little more than ſufficient for home-conſumption; it is incumbent upon every man to propoſe publicly whatever means he may ſuppoſe likely to avert or alleviate the impending calamities.

There are perhaps few publications better calculated to promote ſo deſirable an end than the

the Eſſay of M. PARMENTIER, *which gained the prize propoſed by the Academy of Beſançon, in* 1777; *and appeared in* 1780, *conſiderably enlarged and improved, under the title of "Recherches ſur les vegetaux nourriſſans qui dans le temps de diſette, &c."*

The author is advantageouſly known by ſeveral works, in which the ſkill of the Philoſopher is united with the benevolence of the Citizen of the World: his Treatiſe on the Cheſnut, his Perfect Baker, his Oeconomical Eſſay on Potatoes, and the book above-mentioned, are ſo many inſtances of the ardour and ſucceſs with which he has laboured in the ſervice of the moſt numerous, and therefore the moſt valuable claſs of ſociety.

The frequent and ſevere attacks of ſcarcity, and even of famine, felt in France, render reſearches like M. PARMENTIER's *an object of the higheſt national importance; and, unhappily, the preſent year has afforded ample proof, that no fertility of ſoil, or ſkill in huſbandry,*

can abſolutely ſecure any nation againſt ſuch diſaſters.

As the Work from which the following obſervations are extracted, has been well received by the judicious and humane in every part of Europe, it will probably be aſked why it was not publiſhed entire, rather than in its preſent mutilated form? The anſwer is not difficult, and it is hoped will be ſatisfactory. The author has entered into ſo many minute inveſtigations, both chemical and phyſiological, as to render his Work not only too bulky for thoſe for whoſe benefit the preſent publication is deſigned, but above their comprehenſion: ſuch details can be intereſting to the phyſician and philoſopher only; whereas general utility is the object of the following pages: in this view, the articles relating to the matter of nutriment—to the conſtituent parts of corn—the numerous objections to Potatoes, and bread of Potatoes, with the anſwers—beſides many others, have been omitted: and with the part that has been retained, conſiderable liberties have been taken;

for

for every paragraph and ſentence, which did not convey ſome uſeful information, has been ſuppreſſed.

Whether any of the preparations pointed out by M. PARMENTIER *may be uſeful to the navy; or whether they deſerve to be enumerated among thoſe viſionary projects, which every day obtrude upon the attention of thoſe who fill high and important offices in the ſtate, let the miniſters of the marine determine. Should Potatoes be found, on further trial, to poſſeſs the antiſcorbutic virtues of late attributed to them, they will become an object hardly leſs intereſting in times of the greateſt plenty than in thoſe of ſcarcity, eſpecially ſince a mode of preſerving them to any length of time has been diſcovered. The cultivation of them, already carried to a great height, cannot be too much encouraged; for, as M.* PARMENTIER *obſerves, (and the preſent ſeaſon furniſhes a remarkable inſtance of the truth of his obſervation) the years moſt unfavourable to grain yield the moſt abundant crops of this valuable root.*

Dec. 1782.

OBSER-

OBSERVATIONS, &c.

CHAPTER I.

OF THE USE OF POTATOES IN SUBSTANCE.

AMONG Potatoes there are infinite varieties of colour, bulk, ſhape, conſiſtence, and taſte: but theſe varieties are not always, as it hath been pretended, the effect of ſoil, ſeaſon, and care beſtowed in cultivation; they ariſe from a real difference of ſpecies; for there are correſponding differences in the parts of fructification; the flowers being ſometimes of a cineritious grey and dirty white, and ſometimes of a pale red or fine blue; the verdure of the leaves, the ſtalk and fruit, are alſo ſubject to varieties; there are both

early and late Potatoes: it nevertheleſs appears that the conſtituent parts of the roots are always of the ſame nature, differing only in proportion.

ALTHOUGH the good effects of Potatoes in ſubſtance are fully proved by the daily uſe which whole nations and ſeveral of our own provinces make of them, yet they have not eſcaped the ſhafts of calumny. How many imaginary evils have been imputed to them! How many forged tales would have been circulated againſt them, if a multitude of writers, well qualified to decide concerning the effects produced by food in the animal œconomy, had not defended and juſtified that which is afforded by theſe roots! It was on ſuch an occaſion that the Faculty of Medicine at Paris being conſulted by the Comptroller-general on the wholeſomeneſs of Potatoes, charged with cauſing diſeaſes in ſome of our provinces, made a report highly favourable to them, and well calculated to diſſipate all apprehenſions.

BUT

BUT as it would be inſufficient to remind prejudiced perſons, that in the moſt populous provinces of Germany many millions of men ſubſiſt almoſt entirely on this food; or to quote the remark of an excellent obſerver concerning the Iriſh, whoſe chief nouriſhment conſiſts of Potatoes:—(The Iriſh, ſays he, are robuſt: they are ſtrangers to many diſeaſes by which other nations are afflicted; nothing is more common than to meet with perſons advanced in years, and to ſee twins playing about the hut of the peaſant.)—I conceived, that in order to quiet all alarms, and to remove every ſubterfuge of prejudice, it would be neceſſary to enter upon ſome chemical diſcuſſions and enquiries.

I THEREFORE proved, by a long train of experiments, that Potatoes in their natural ſtate contained three diſtinct and eſſential principles, when each was examined by itſelf; *viz.* 1. a dry powder, reſembling the ſtarch contained in grain; 2. a light fibrous matter, of a grey colour, and of the

ſame nature as that contained in the roots of pot-herbs; 3. laſtly, a mucilaginous juice, which has no peculiar properties, but may be compared to the juice of ſucculent plants, ſuch as borage and bugloſs.

I NEXT diſtilled Potatoes in a retort; they gave out an immenſe quantity of water, which towards the end of the operation became more and more acid; next there paſſed a light and an heavy oil, reſembling that generally obtained from the parts of plants containing flour. A pound of theſe roots leaves ſcarce 36 grains of earthy reſiduum which has all the characters of vegetable earth.

WHAT effects then are produced by the boiling which theſe roots are made to undergo before they are eaten? It tends to combine theſe different principles more intimately, and to form a whole more ſoluble and of eaſier digeſtion. To divide the Potatoes afterwards by means of a grater, and to ſet them under the preſs,

would be to little purpoſe: it would be impoſſible to expreſs a ſingle drop of water, or to precipitate a particle of ſtarch.

It is well known that the veſſel in which Potatoes have been boiled is by that operation coloured green, and they ſometimes leave behind them a ſlight acrimony ſufficiently ſenſible to the throat: now theſe circumſtances afforded ſufficient ſcope to the vilifiers of this valuable plant, to impute ſeveral diſeaſes to it: but I further proved that theſe two properties do not belong to the whole of the root, but only to the red ſkin by which it is covered externally, and that ſeveral other roots preſent the ſame phænomena, ſuch as radiſhes, which loſe their colour as faſt as they come in contact with boiling water, tinging it with a green hue, and at the ſame time parting with their well-known pungency; and laſtly, that this colouring matter with which the ſkin of the Potatoe furniſhes water, is ſimply extractive, and contains nothing virulent or ſaline.

Besides, how can this green colour be noxious, when roaſted Potatoes, which retain it, are as wholeſome as boiled? nay, they are more ſavoury and delicate; an advantage ariſing from the diſſipation of the aqueous fluid, and perhaps from the ſame extractive matter which communicates the green colour to water.

Some of the advocates for Potatoes, alarmed by this green colour, and perſuaded that it exiſts in their juice, have propoſed to extract it, and ſubſtitute water in its ſtead; but there cannot perhaps be a more abſurd propoſal. In our iſlands the juice of the mangoe is ſeparated becauſe it is really poiſonous; I have alſo imitated the proceſs of the Americans in ſeveral indigenous, farinaceous roots, which without this previous extraction would be very dangerous: but the juice of the Potatoe is far from containing any thing ſimilar; like all the other principles, it is eſſential to it when we would eat it in ſubſtance. In order to ſeparate it, the aggregation

muſt

muſt be broken, the fibrous nets muſt be torn in pieces, and the expreſſed reſiduum be employed only in the form of pap; which, inſtead of adding to the wholeſomeneſs of Potatoes, would make an inſipid, heavy, and indigeſtible food.

THE vegetable kingdom affords no food more wholeſome, more eaſily procured, or leſs expenſive, than the Potatoe. It is well known with what reſources it furniſhed the Iriſh in 1740; many families would have been ſwept away without this ſupply: the eagerneſs with which children devour it, the preference which they give it to the cheſnut, would ſeem to ſhew that it is well adapted to the conſtitution of man: perſons of all ages and temperaments feed upon it without experiencing the ſlighteſt inconvenience. In the laſt German war theſe roots were the reſource of many ſoldiers, who happening to be ſeparated from the main body of the army, would have fallen ſacrifices to fatigue and hunger, if they had not met with Potatoes, which they eat

in exceſſive quantities after ſimple boiling, and with no other ſeaſoning than a good appetite: gratitude induced ſeveral of them to import the plant into their own country, where it was unknown: they cultivated it with ſkill, and ſet an example which was ſoon imitated. At preſent there is ſcarce an elegant repaſt where Potatoes are not introduced with emulation in various diſguiſes; and the great conſumption in the Capital, proves that they are no longer deſpiſed there.

The exceſſive price to which grain has been advanced of late years, forms a remarkable æra at which the beneficial qualities of Potatoes have been begun to be tried in many places. An officer of diſtinction, while he was improving one of his eſtates, grew a great quantity of Potatoes, but being well acquainted with the ſtubbornneſs of ruſtic prejudices, he was aware that the eloquence of example would be infinitely more perſuaſive than whatever he could ſay: he had five dogs, a yard well

ſtocked

ſtocked with poultry of every ſort, twenty cows, and two pigs, to feed daily: he explained to his ſervants his intention of nouriſhing all the animals with Potatoes alone; by which means the grain which they would have conſumed might be employed for the ſervice of men. His orders were punctually obeyed, becauſe the puniſhment of diſobedience was the diſmiſſion of the firſt who was guilty of it. Pretending afterwards that the Potatoe was difficult of digeſtion, he forbade his ſervants to eat them. Theſe contrivances produced the expected effect, and thus he made this plant an object of attention in his neighbourhood.

If we conſider all the properties of Potatoes, we ſhall be forced to acknowledge, that if there really exiſts a medicinal food, it is to be found in theſe roots. All the Engliſh authors who have ſpoken of Potatoes, regard them as light and very nutritious. Ellis, who paid great attention to the culture of them, beſtows the moſt

pompous

pompous epithets upon them, and announces them as the food of all others moſt ſuitable to his countrymen, on account of their general practice of eating great quantities of fleſh. Lemery in his Treatiſe on Food, and Tiſſot in his Eſſay on the Diſeaſes of People of Faſhion, agree in recommending ſtrongly the uſe of Potatoes: But I will ſelect a few obſervations from the great number of which I can anſwer for the truth, by way of reply to the objections that have been brought againſt Potatoes.

M. Engel in his Inſtructions how to cultivate the Potatoe, informs us, that ſeveral of his friends who had lived three years almoſt on Potatoes alone, experienced no inconvenience, and were far from being ſatiated: among others he mentions a maiden lady 33 years of age, who was in ſo bad a ſtate of health, that her appetite was quite gone and her ſtomach incapable of digeſting any thing, when ſhe happened to take a fancy to live on Potatoes; ſhe experienced ſuch happy effects from this

diet,

diet, as to recover her gaiety, plumpneſs, and appetite in a ſhort time.

A MERCHANT of a very ſtrong conſtitution was ſo reduced by an illneſs of nine months continuance, that he voided his food juſt as he took it; one day he thought of eating Potatoes, by which he was ſo much benefited, that he declared to me that the good ſtate of health which he now enjoyed was owing to them alone.

I HAD a relation of a keen appetite, and in the habit of uſing conſtant exerciſe: he could not eat the ſeeds of any leguminous plant without being afterwards tormented by the heart-burn, but found that Potatoes never produced any ſuch effect. I know ſome perſons who live on milk and Potatoes alone, not being able to digeſt any other food: I am acquainted with others who have been cured of a ſcorbutic taint by the moderate uſe of Potatoes; their ſtomach, ſo far from being weakened, acquired greater ſtrength and vigour.

THESE

These obſervations, which might eaſily be multiplied, and which are confirmed by my analyſis of Potatoes, prove how far theſe roots ought to be exempted from all ſuſpicion of lying heavy on the ſtomach of thoſe who uſe them for food, ſince every pound contains 11 ½ ounces of water, and the 4 ½ ounces of ſolid parts remaining, afford ſcarce a drachm of earth.

Another objection ſtill ſubſiſting in force againſt the wholeſomeneſs of Potatoes is, that as they belong to the family of Solanum, they muſt needs poſſeſs narcotic properties; but experience has long ſince ſhewn how little ſuch botanical analogies are to be depended on. Is it not well known that the family of convolvulus, which is in general acrimonious, pungent, and cauſtic, and ſupplies medicine with its moſt draſtic purgatives, affords in the Batatta a mild ſaccharine aliment, which, to be uſed for food, needs only to be boiled? It is indeed true that ſome obſervations with which I have been favoured, ſeem to

ſhew

ſhew a ſoporific virtue in the Potatoe; and as I have no intereſt in concealing any thing, I will ſet them down here.

A DOMESTIC of the Baron de St. Hilaire, after a malignant fever could not recover his ſleep: his maſter ordered him to ſup on Potatoes; and that very night he ſlept ſix hours without intermiſſion: the continuance of the ſame practice produced the ſame effect, without cauſing any change in his conſtitution.

MR. M. of a meagre habit, but of an uninterrupted good ſtate of health, during two years made conſtant uſe of roaſted Potatoes, ſeaſoned with a little butter and ſalt; having been always before accuſtomed to eat very ſparingly at his evening meal, he acquired from reliſh the habit of eating ſix or ſeven of the largeſt Potatoes for ſupper: it is proper to remark, that he ate bread in proportion: he never experienced any inconvenience from this practice; but what induced him to abandon it was, that being

being obliged to riſe early, he ſuppoſed that his ſleep was more profound, and that he awaked with greater difficulty; he however thinks that theſe effects aroſe from the exceſs, and that he ſhould have experienced the ſame thing from any other ſupper, exceeding the bounds of moderation. When he eats Potatoes he is not ſenſible of any change in his ſtate of body.

I ADDUCE this laſt obſervation with the greater pleaſure, becauſe, the philoſopher who is the ſubject of it, may be quoted as an authority in medicine. If exceſs in this food induces ſleepineſs, what other exceſs would not be attended with more pernicious conſequences? if we even ſuppoſe this ſoporific virtue to be inherent in the Potatoe, continual uſe will make it quite ineffectual, as it happens to all kinds of aliment, which have been ſuppoſed, on no better grounds to poſſeſs particular properties. The quantity of water contained in Potatoes, may moderate the effervescence of the

blood, by giving it a greater degree of conſiſtence, but without rendering it at the ſame time more viſcid.

The property which of all others renders the Potatoe ſo valuable in the country, is, according to the teſtimony of the faculty of medicine at Paris, its improving the quality and encreaſing the quantity of the milk of animals: it produced this effect on the nurſes of the poor infants of the pariſh of St. Roch: at leaſt the phyſicians of this pariſh, in their printed certificate, atteſt that this food is not only more wholeſome than any other procurable by the poor, but likewiſe that it prevents many diſeaſes to which children are ſubject, and by which great numbers are cut off, ſuch as ulcers, diſeaſes of the eyes, atrophy, &c.

CHAPTER II.

OF THE USE OF POTATOES, IN BREAD.

WHILST Potatoes were conſidered in France only as an additional article to the luxury of our tables, their uſefulneſs as a food was little attended to; they did not become a ſerious object till the poſſibility of converting them into bread, that is to ſay, of increaſing the quantity of that prepared from the flour of different grains, was perceived. I muſt own, that in 1771, when I was analyſing theſe roots, I had this object in view; perſuaded that in the form of bread they would be an uſeful ſupplement in times of ſcarcity of grain, and that at all times it would be a ſure way of making it ſerve from one harveſt to another in thoſe diſtricts where Potatoes are much cultivated; and by theſe means alſo they might be appropriated for food when they could no longer be eaten in ſubſtance.

It was ſcarce found that Potatoes mixed with common dough, are made to diſappear, by means of kneading, ſo as to form an homogeneous and well-raiſed maſs, when theſe roots were believed to be changed into real bread. Enthuſiaſm laid hold of men's minds; different methods were propoſed, each perſon boaſting his own: the conſequence was, that many, miſled by a deceitful appearance, have aſſerted, and even now repeat, that they have prepared, ſeen or eaten bread made of Potatoes; they have even gone ſo far as to diſpute for the honour of the invention; though the Iriſh had recourſe to this ſubſtitute almoſt as ſoon as they began to make uſe of Potatoes. Their attempts are preſerved in ſeveral parts of the Philoſophical Tranſactions; to which I refer thoſe who may yet cheriſh the hope of advancing any claims relating to this point: I would at the ſame time beg them not to confound any longer, bread in which Potatoes are introduced,

and that conſiſting of theſe roots alone and unmixed.

First attempts, however imperfect, are always received with joy, eſpecially when the ſubſtance in queſtion has any connection with the ſubſiſtence of the moſt indigent claſs of citizens; but even with the moſt upright intentions it ſeldom happens that the advantages that may be derived are not exaggerated. To introduce into dough compoſed of flour, leaven, and water, $\frac{1}{3}$ or $\frac{1}{2}$ of a watery root, without at all prejudicing the product, was a moſt agreeable proſpect, when conſidered in an œconomical view: that the ſaving was not in proportion to the quantity of the ſubſtitute employed, could be learned only from experience.

Another circumſtance not attended to, and which nevertheleſs deſerved attention, was, that the pulp of Potatoes mixed with wheat dough, ſo much increaſes the mechanical effect of the glutinous part of that

that grain, that it ſwells too much during the preparation and in the oven; hence the bread is extremely light, continues but a ſhort time in the ſtomach, and paſſes too ſoon into the lower inteſtines.

Should we admit that half the weight of this bread conſiſts of Potatoes, it will not follow that the nouriſhment is increaſed in the ſame proportion; there can be at moſt but one part, of which the nutritious effect is equivalent to an equal quantity of flour of wheat: let me confirm this by an inſtance;—ſuppoſe two paſtes of an equal conſiſtence, the one conſiſting of 4 pounds of pulp of Potatoes, and as much flour of wheat, the other of flour of the ſame grain unmixed; the firſt will afford leſs bread; this bread will contain more water, and will not be ſo nutritive as the ſecond maſs, becauſe the Potatoe can furniſh but one-third at moſt of its weight in farinaceous matter, that can be compared with the flour of grains; the ſurplus is nothing but the

water of vegetation, which keeps the principles of theſe roots at a diſtance from each other, and in a ſtate of great diviſion.

With reſpect to the diſappearance of Potatoes in the above-mentioned mixture, this phænomenon ought to cauſe no more ſurprize than others of daily occurrence; as for inſtance, when pulpous fruits, ſuch as the pumpion, gourd, the herbaceous ſtalks of plants, the fleſhy roots, are added to flour of wheat, ought it to be concluded that all ſubſtances which, without being farinaceous, can be ſo aſſimilated with dough as not to be diſtinguiſhable except by the organ of taſte, are transformed into bread? or that when the maſs has been increaſed two-fold, and even three-fold, the nutritive virtue has received an equal augmentation? Several facts prove the contrary: and the inhabitants of the Pays de Vaud, among others, who have been much accuſtomed to eat this mixed bread, complain that the appetite is not eaſily ſatisfied with it.

It would undoubtedly be wrong to infer from this obſervation, that the preſence of Potatoes is capable of impairing the nutritive effects of the ſubſtances to which they are added, and of conſequence that the practice of mixing them with the flour of different grains ought to be diſcontinued; but let me repeat it once more, they can nouriſh only in proportion to the quantity of ſubſtantial matter which they contain; and it would be ridiculous to require as much nouriſhment from a watery root as from a dry ſeed, which in order to be uſed as a food, muſt previouſly be combined with a fluid.

If there are particular circumſtances in which recourſe ſhould be had to the ſupplement of Potatoes for the preparation of white bread, it muſt be when the quantity of wheat is not in proportion to the conſumption. As it is the common food of the rich and the inhabitants of cities, it is of little importance whether it is more or leſs ſubſtantial; in general

it is only an addition to other meats; but this does not hold with reſpect to the brown meal of the ſame grain; it has not ſo much viſcidity as the white; the mixture of Potatoes gives it more bulk, lightneſs and quality.

Next to wheat, rye is the moſt valuable grain; both, mixed or ſeparate, afford, if well prepared, a very excellent bread, without the neceſſity of any addition: but when they are ſcarce, and brought from a great diſtance, and very dear, the Potatoe, if there is a ſufficient ſtock, would make a ſaving of other grains, which ſerve the moſt indigent claſs.

If it is important to ſet bounds to the practice of uſing Potatoes to enlarge the bulk of wheat and rye bread; it is proper to remark, that this practice is extremely wholeſome for barley, buck-wheat, maize, oats, millet, &c. with which bread is prepared in different diſtricts of the realm; for this bread, whether compoſed of the meal

meal pure or mixed, is conſtantly heavy, cloſe, and ill-taſted. In this caſe the addition of an equal part of Potatoes would occaſion very deſirable changes in theſe ſeveral kinds, by giving tenacity and viſcidity to the dough, by promoting the fermentative motion, by weakening and even deſtroying the diſagreeable taſte peculiar to each of them.

In the preſent caſe, not only the quantity of bread will be increaſed, but the quality will be improved; a great advantage for the poor in general, and even for whole diſtricts, which conſume only theſe kinds of grains. For the ſake of this claſs of people, it will be proper to point out a method by which the grain may be ſaved and the bread improved. In this view, I will give a receipt for the compoſition of this bread; it will ſerve as a model for every other propoſed to be made in this way with all farinaceous ſubſtances indiſcriminately, provided they are in a proper ſtate for making bread:

TAKE any quantity of Potatoes, well cruſhed and bruiſed; mix them with the leaven prepared the evening before in the uſual way, with the whole of the flour deſigned for making the dough, ſo that one-half may conſiſt of pulp of Potatoes and half of flour; knead the whole with the neceſſary quantity of warm water; when the dough is ſufficiently prepared, put it in the oven, taking care not to heat it ſo much as uſual, not to ſhut it up ſo ſoon, and to leave it longer in; without this eſſential precaution, the cruſt of the bread would be hard and ſhort, while the inſide would have too much moiſture and not be ſoaked enough.

WHENEVER it is propoſed to mix Potatoes with the dough of different grains, either to ſave a part or to improve the bread, theſe roots ſhould be reduced into the form of a glutinous paſte, becauſe in this ſtate they give tenacity to the flour of ſmall grain, which are always deficient in this reſpect.

The other ways of preparing Potatoes before mixing them with the flour, are not nearly ſo advantageous as boiling them; theſe ways may be reduced to two principal ones: according to the firſt, they are taken raw and grated; here they are employed without loſing any part of their juice and ſkin: the ſecond conſiſts in cutting them in ſlices, then baking, and afterwards taking them to the mill: but the bread in both caſes is dark-coloured, cloſe, and ill-taſted.

Were all theſe methods even leſs defective than they are in reality, they do not obtain the end propoſed; *viz.* ſaving the expence of boiling, and the other operations; for it will coſt at leaſt as much to grate or dry the Potatoes: it is not only neceſſary to boil, but alſo to cruſh and manage them ſo as to give them the conſiſtence and form of a tenacious and viſcid paſte, in order that they may produce the effects above deſcribed.

Let me recapitulate. It cannot be doubted, that if wheat and rye were very ſcarce, and their high price obliged men to ſeek a ſupplement in other grains, it would be better to have recourſe to a mixture of Potatoes: they may beſides ſerve to give other grains a ſuperior degree of goodneſs. It is well known, that in times of dearth, neceſſity, incapable of making any enquiries when exceſſive, always guides the hand to objects ill calculated to fulfil our intentions, and productive of effects the moſt oppoſite to our wiſhes.

But, in circumſtances affording no other means of ſubſiſtence but Potatoes in plenty, the converſion of them into bread would be advantageous, becauſe there are multitudes ſo habituated to live upon bread, that they would not believe that their appetite was ſatisfied, if food was offered them in any other form.

I come now to deſcribe the prepara-

tion, which is to ſerve as a baſis for all the farinaceous plants, afterwards to be pointed out as proper to ſupply the place of our common aliments when they fail.

CHAPTER III.

OF THE WAY TO MAKE BREAD OF POTATOES, WITHOUT MIXTURE.

PREVIOUS to any attempts to convert the farinaceous parts of plants into bread, it is neceſſary to prepare them by certain preliminary operations: the intention of theſe operations is to diſpoſe their conſtituent parts to unite with water, and thus to give them a degree of ſoftneſs and flexibility, favourable to the fermentative motion which is to take place among them. Such is the chief end of the proceſs which I am now to deſcribe; it naturally precedes the taſk of the baker, in the fabrication of any bread whatever.

Of

Of the Starch of Potatoes.

After having repeatedly waſhed the Potatoes, in order to ſeparate the dirt and ſand, divide them by a grater of tin ſet in a wooden frame and reſting on a ſearce; empty it when full into a larger veſſel: the grated Potatoe affords a liquid paſte, which grows darker coloured on being expoſed to the air; pour ſome water on this paſte, and ſtir it about with a ſtick or your hands, and pour the whole into a ſearce placed over another veſſel; the turbid water which paſſes through, carries the ſtarch along with it, and depoſits it at the bottom of the veſſel: the reddiſh water is to be thrown away, and freſh quantities are to be added till it is no longer tinged.

After this firſt operation, the proceſs of the Starch-maker ſhould be exactly imitated; the precipitate, when well waſhed, is to be taken out, divided into parcels, and

and ſet upon ſearces or boards expoſed to the ſun in order to diſſipate the exceſs of moiſture; as it dries, the dirty grey colour changes to a ſhining white: this ſubſtance is real ſtarch, and by being ſifted through cloſe ſearces, acquires a tenuity equal to that of the fineſt ſtarch of wheat.

What remains on the ſearce, although deprived both of ſtarch and extractive matter, may ſerve, like bran, for feeding cattle: it may alſo be reduced to powder, for a purpoſe which I ſhall have occaſion to mention in ſpeaking of the brown bread of Potatoes. There are ſituations where nothing ſhould be loſt, eſpecially of the objects of immediate neceſſity.

Remarks.

The moſt important obſervation that occurs here, is, that Potatoes, to whatever variety they may belong, and in whatever condition they may happen to be when they are uſed, provided they are raw, conſtantly

ſtantly afford ſtarch, differing only in quantity; hence Potatoes ſpoiled by froſt, germination, or too ripe, may be uſed for this purpoſe.

If it ſhould be requiſite to employ the ſtarch immediately, and circumſtances not allowing time to provide a ſtock, or to wait till it can be dried and paſſed through the ſearce, it may be uſed as ſoon as it is ſeparated; but the water, which conſtitutes about one-half of its weight, ſhould be deducted. I even think that I have obſerved, that in its wet ſtate it renders the dough a little more tenacious, and the bread whiter.

It is neceſſary to break the aggregation of the integrant parts, to tear in pieces the fibrous nets, and to force the ſtarch contained in them to quit its place of reſidence: wherefore an inſtrument calculated only to ſlice or bruiſe theſe roots, would be quite uſeleſs in the preſent caſe.

To theſe obſervations let me add, that though all ſorts of Potatoes are capable of being changed into bread, the round, grey ones afford moſt ſtarch; every pound produces nearly from two to three ounces: but as I have already remarked, the ſeaſon, ſoil, and cultivation, have great influence in this reſpect.

Of the Pulp of Potatoes.

As ſoon as the Potatoes are well baked or boiled, they ſhould be peeled, and then cruſhed with a rolling-pin or the hand upon a table. Scarce have they loſt their form, when they begin to ſtick together and to form a paſte, which grows more and more elaſtic and ſpungy, without the neceſſity of adding any fluid: this proceſs is to be continued till every lump is broken; then it is to be ſet aſide: and the whole ſhould be thus reduced.

As Potatoes do not acquire the tenacity of a pulp but whilſt they are yet warm,

and

and as by a neceſſary conſequence the pulp itſelf loſes its viſcidity as it grows cold, the trouble of boiling theſe roots ſeveral times a day may be avoided, by putting them, boiled and peeled, to ſoak a ſhort time in the hot water deſigned for kneading: by theſe means they are made to regain under the rolling-pin their viſcidity; a quality eſſential and indiſpenſable in the fabrication of bread.

The pulp of Potatoes may be kept two days and longer, according to the ſeaſon, without danger of ſpoiling. It then indeed is not ſo tenacious, and does not ſo nearly reſemble the glutinous matter of wheat; and it is of the greateſt importance that it ſhould bear the ſtrongeſt reſemblance to this matter, both in tenacity and elaſticity, the other chemical properties in which theſe two ſubſtances differ from each other, being totally inſignificant in the making of bread.

Remarks.

It is with Potatoes as with the roots of pot-herbs and leguminous ſeeds: the nature of the water has a ſingular influence on the ſucceſs and quickneſs of the boiling. The hardneſs of the water may be diminiſhed by boiling. But Potatoes ſhould never be drowned, nor ſhould the veſſel which contains them be ever uncovered, becauſe the water, after it has been reduced into vapour, ſhould be driven back, in order the better to inſinuate itſelf into the texture of each tubercle, to penetrate and combine more perfectly its conſtituent parts; in conſequence of which they are ſooner boiled and more ſavoury. This obſervation holds with reſpect to all vegetable, fleſhy, and aqueous ſubſtances, which ought not when they are boiled to be drowned with water, unleſs they contain a matter neceſſary to be extracted, and in that caſe too much water cannot be employed.

I HAVE obſerved, that the preparation of ſtarch admitted indifferently every ſort of Potatoes in every poſſible ſtate; but we cannot hope for the ſame advantages in obtaining the pulp; this preparation requires choice; the red ſort ſeems to afford the moſt tenacious and elaſtic paſte, and conſequently merits preference: it is of great importance that they ſhould be ſound and free from defects.

IT would be impoſſible to make bread of Potatoes without the aid of the pulp, ſince it is that alone which gives tenacity and viſcidity to the ſtarch, which is quite deſtitute of theſe qualities.

Of the Leaven of Potatoes.

MIX half a pound of pulp of Potatoes with an equal quantity of the ſtarch, and four ounces of boiling water; ſet the mixture in a warm place: in forty-eight hours a ſlight vinous ſmell ſhould be exhaled from it; and now a freſh portion of

ſtarch, pulp, and water, ſhould be added, and the maſs again expoſed to the ſame temperature for the ſame ſpace of time; this operation ſhould yet be repeated a third time. The paſte thus gradually turned ſour may be conſidered as a firſt leaven.

In the evening dilute this firſt leaven with warm water, mix equal parts of ſtarch and pulp in the proportion of one half of the dough, ſo that for every twenty pounds of dough ten of leaven muſt be prepared; when the mixture is exactly made, put it in a baſket, or leave it in the kneading tub all night, taking care to cover it well, and to keep it warm till morning.

Remarks.

The tedious and troubleſome preparation of the firſt leaven will be avoided after the firſt baking, becauſe a piece of the dough may be ſet aſide and kept.

The trouble attending the preparation of this firſt leaven, may be avoided by introducing at the firſt baking ſome leaven of dough or yeaſt, without the neceſſity of mixing the ſtarch and pulp; I will even obſerve, that it does not gain the character of good leaven, till ſome time after its formation: this law is common to every leaven prepared in the ſame manner, even to that of wheat, for the bread is always ſtiff and heavy when ſuch a leaven is firſt uſed. My motive for pointing out ſo long a proceſs was, to prove that the Potatoe was capable of ſerving for the elements of leaven, and that, like grain, it might be made to undergo the bread fermentation, without the aid of any foreign agent.

Of the dough of Potatoes.

In order to prepare the dough, the leaven ſhould be ſet in the middle of the ſtarch, ſurrounded by the pulp, divided into pieces; it ſhould be diluted with ſome warm water, to which half a drachm

of ſalt for every pound of the mixture ſhould be added; and when the whole is confounded by kneading, it ſhould be ſubjected to the different operations proper to increaſe its viſcidity and tenacity; that is to ſay, it ſhould be lifted up, gathered and beaten; but the fiſts ſhould not be thruſt into it, which is a very general but very bad practice in the making of bread of all ſorts.

As ſoon as the paſte is kneaded it ſhould be divided and formed into loaves of a proper ſize, which ſhould be ſet in tin moulds, ſprinkled over with bran or ſtarch, to prevent the adheſion of the dough, which generally takes place without this precaution: the moulds ſhould be covered with a wet cloth, and left in a warm place for two or three hours, according to the ſeaſon.

Remarks.

As it is eaſy to obtain bread of different degrees of conſiſtence, by only varying the

quantity of water uſed for kneading, it follows that it may alſo be obtained lighter or heavier from Potatoes, by varying the proceſs in the ſame manner.

The quantity of ſalt may alſo be varied: the water ought always to be near the boiling point; and we need not fear leſt it ſhould deſtroy, as when wheat flour is uſed, the tenacity of the dough, on the contrary, at this temperature, it contributes to increaſe it; thus the ſame end is often attained by different and even oppoſite means.

The time required by the dough to attain the proper degree of fermentation cannot be exactly aſcertained, becauſe it is regulated by the ſeaſon: this muſt be learned from experience: I will only remark, that it is always rather longer than that required by wheaten dough.

Of the Baking.

When the leaven has been prepared the evening before, the kneading properly executed, the dough turned immediately afterwards, and diſtributed in moulds, the operator ſhould yet wait two or three hours before he heats his oven, and this proceſs requires two hours; then the dough may be put in, after the ſurface has been moiſtened again: it ſhould be kept in the oven an hour, or two hours at moſt.

Remarks.

The bread in queſtion requires a long continued fermentation, and an oven very gently heated.

In order to induce perſons to uſe all the precautions I lay down, it is neceſſary ſometimes to explain their effects: Now I recommend turning the dough as ſoon as it is kneaded, leſt while it continues in

the lump its viſcidity ſhould be ſo far impaired as to prevent its being handled and ſhaped: the ſurface ſhould be kept moiſt leſt it ſhould be ſuddenly ſeized by the heat, and becoming hard and thick hinder the baking of the center, and the exſuding of the moiſture from the ſoft part.

CHAPTER IV.

OF THE BREAD OF POTATOES.

BY this method I will venture to aſſert, from various and repeated trials, that the Potatoe, which hitherto hath not been converted into a well-raiſed bread, without the mixture of at leaſt an equal quantity of ſome flour, may be made to aſſume that form without any foreign aſſiſtance: the whole artifice conſiſts in ſubjecting theſe roots to two previous operations

tions before the application of the uſual proceſs of the baker.

Bread of Potatoes is then compoſed half of ſtarch and half of pulp, with half a drachm of ſalt to every pound of the mixture. The water, which conſtitutes about $\frac{1}{5}$ of the whole maſs, is totally diſſipated during the baking; hence, in order to obtain a pound of this bread, three pounds and an half of Potatoes, *i. e.* nine ounces of ſtarch, and as much pulp, are requiſite. But it is of conſequence to remark, that in this diminution our roots loſe only their exceſſive moiſture. The nutritive matter which they contain, ſo far from being impaired in its effects, muſt neceſſarily have gained by the bread fermentation, a proceſs that is well known to improve all farinaceous ſubſtances indiſcriminately, by increaſing their bulk and ſolubility.

It is poſſible to obtain from Potatoes a brown bread yet more œconomical. In order

order to effect this, theſe roots and the fibrous matter remaining on the ſearce after the extraction of the ſtarch, ſhould be dried, and then reduced to powder, with which an equal quantity of boiled Potatoes, reduced to a pulp in the manner deſcribed above, ſhould be mixed: in this caſe peeling them may be diſpenſed with, ſince the kneading performed by robuſt arms will completely divide the ſkin; but this brown bread, whatever care is taken in preparing it, is always cloſe, heavy, and ill-taſted.

YEAST diluted with water, is the proper ferment to be employed, wherever brewing is practiſed.

I WOULD propoſe to add one-twelfth of meal in the preparation of this bread; by this means fifty pounds of grain, ſcarce enough for a month's ſuſtenance, would furniſh bread for the whole year.

CHAPTER

CHAPTER V.

OF THE BISCUIT OF POTATOES.

IN order to prepare biſcuit of Potatoes, mix a little yeaſt or leaven diluted with hot water, with one pound of pulp of Potatoes, and as much ſtarch; of the whole form dough, and knead it long; after which, ſeparate pieces of about three quarters each, and flatten them ſo as to leave them about twenty-four inches in circumference, and fifteen or ſixteen lines in diameter.

WHEN the dough has been thus divided and ſhaped, ſet it upon plates, and in about an hour afterwards put it in the oven, firſt pricking it with an iron inſtrument, provided with ſeveral teeth, in order to prevent it from ſwelling, by promoting the evaporation from every point.

As

As this dough contains but little water, it is more difficult to be baked; hence it muſt be left in the oven longer than the bread, for two hours at leaſt, and the rather as it ought to be baked more.

The biſcuit at its being taken out of the oven ſhould be ſet in a warm place, that it might cool gradually and be deprived of its moiſture, which is continually exhaled as long as the heat ſubſiſts. It is of great conſeqence not to pack it up under five or ſix days after it has been made, and to keep it in as dry a place as poſſible.

Biscuit of wheat in general loſes $\frac{1}{3}$ of its weight in the oven; hence in order to obtain half a pound, $\frac{3}{4}$ of the firmeſt dough muſt be uſed. Our biſcuit undergoes a nearly equal loſs; the water employed for diluting the leaven, and which is ſufficient for kneading, is diſſipated entirely, together with a portion of that which forms a conſtituent part of the pulp.

Dif-

DIFFERENT kinds of biſcuit, according to the length of the voyage and the latitudes to be traverſed, are prepared from wheat. In cold and dry climates biſcuit is leſs liable to ſpoil; its firſt alteration proceeds from its attracting the moiſture of the air, becoming internally mouldy, and contracting a bad ſmell, whence it ſoon becomes food for worms. This inconvenience may be always prevented, by drying the wheat perfectly, grinding it well, and not ſeparating, as it is the practice of ſome places, the flour from the coarſer part, *(le gruau)* which is the drieſt, moſt ſavoury, and moſt nutritious part of the grain.

THE quality of biſcuit does not always correſpond to that of the grain of which it is made; it often depends on the proceſs: every nation ſeems to have adopted one peculiar to itſelf; this uſes a great quantity of leaven, that very little, a third none at all; and yet the taſte of the biſcuit depends on the quantity of leaven. As that made of Potatoes is naturally inſipid,

ſipid, a drachm of ſalt might be added to every pound, without diſpoſing it to ſpoil.

The biſcuit in queſtion, when well prepared, has all the properties of common biſcuit; it breaks ſhort, is ſonorous, and does not crumble on being ſteeped in water. The opinion of ſeveral competent judges, to whoſe examination it was ſubmitted, was extremely favourable to it. The miniſter of the marine accepted and patronized it, obſerving, that the only way of learning whether it would keep as long as wheaten biſcuit, was to put it on board ſome veſſels. This direction was carefully executed; but there is every reaſon to apprehend that it has fallen a prey to ſome of the enemy's privateers.

But if I may be allowed to form a few conjectures from its appearance, and the nature of the farinaceous ſubſtance of which it conſiſts, I think it may reaſonably be preſumed that it will ſtand long voy-

ages;

ages; and, without deſiring to ſet it in competion with common biſcuit, it ſeems to have one advantage over the latter, ſince the Potatoe containing no ſaccharine or glutinous ſubſtance, the biſcuit made of it muſt be leſs liable to attract the moiſture, and conſequently to ſpoil.

The Potatoe grows plentifully every where, and eſpecially in our iſlands, of which it is a native; ſo that the ineſtimable advantage of victualling ſhips there may be obtained, eſpecially at a time of dearneſs of corn, and in circumſtances when dangers at ſea render communication difficult and hazardous.

I have already mentioned the antiſcorbutic quality attributed by ſome authors to Potatoes: Mr. Magellan has lately communicated ſome obſervations to the Academy of Sciences, which prove that theſe roots are really capable of curing the ſcurvy: how much more probable is it then that it will prevent this diſeaſe, ſo formidable

formidable to ſailors? Thus this uſeful claſs of men would find a preſervative in their daily food: it would even be deſirable to put on board a certain quantity of this biſcuit at all times; it would become the regimen of thoſe whoſe blood ſhewed a tendency to ſcurvy.

Why ſhould not the different kinds of Potatoe bread which I have deſcribed, and which keep ſweet for a long time, be embarked on board our veſſels? In order to make the experiment, two loaves newly baked, conſiſting of wheaten flour mixed with Potatoes, were ſealed up and entruſted with a captain of a veſſel ready to ſet ſail for Spain, with an injunction to leave one in the open air and the other in his chamber. The captain returned from his voyage, and even from another undertaken ten months afterwards: theſe two loaves were found equally good. This fact, which proves the benefits that may be derived from this bread, is preſerved in the regiſters of the Royal Society of Agriculture at Rouen.

CHAPTER

CHAPTER VI.

OF THE COARSE FLOUR, SALEP, AND SAGO OF POTATOES.

BY giving directions how the Potatoe may be reduced into various forms, I do not pretend that it acquires at the ſame time all the medicinal qualities attributed to each of the ſubſtances with which I compare it; my intention is only to point out the wholeſome reſources which this root is capable of affording to man, in the ſtate of diſeaſe, when theſe ſubſtances fail.

Of the Coarſe Meal of Potatoes.

UNDER the name of *gruaux*, it is uſual to comprehend the ſeeds of the graſſes, groſsly divided by mills, and freed in part from their cortical cover. The way of turning them to uſe reſembles the original uſe of farinaceous ſubſtances in gene-

ral; it conſiſts in diluting and boiling them in a nutritious vehicle. Now Potatoes, boiled or roaſted, before they have been dried, cannot be brought under this denomination; they rather form a kind of ſalep, as I will ſoon ſhew.

When the Potatoes have been cleaned and peeled, they ſhould be ſliced, and laid on ſearces covered with paper, which are then to be placed in an oven: they very ſoon ſhrink, loſe their tranſparency, and in twenty-four hours become friable enough to be broken to pieces by the action of the mill or peſtle. When they are only bruiſed, they may be diſtinguiſhed by the name of coarſe meal, and by that of flour, when reduced to a fine powder.

The ſlices, when dried, are wrinkled and tarniſhed at the ſurface, and internally whitiſh: when you bite them, you think you have wheat or rye between your teeth: they are rather longer in boiling than the roots

roots when whole and freſh; they beſides have a dark grey colour, and their taſte is ſomewhat different.

The flour obtained from dried Potatoes, is ſoft to the touch, but the colour is a dirty grey: if an attempt is made to form a ball of it with water, it acquires ſcarce any tenacity; when diluted and boiled, like other kinds of coarſe meals, (ſuch as oatmeal, &c.) in milk, broth, or any mucilaginous decoction, it diminiſhes their tranſparency, aſſumes the conſiſtence of broth, emits an odour reſembling that of paſte of flour, and its taſte is leſs agreeable than the Potatoe itſelf before it is dried.

It would be in vain to hope, that grinding and dreſſing, which have ſo much influence on the quality of flour, are capable of improving that of Potatoes; as the extractive matter which they contain, has not been combined by the operation of drying, it is ſo far developed as to be

very ſenſible, both to the eye and the taſte, in every preparation into which it is introduced; either in wheaten bread, which it renders diſagreeable and brown, or in porridge, which is of a yellow colour, and unpleaſant taſte; it may indeed be corrected by ſugar or aromatics.

From what has been ſaid, it appears that the flour of Potatoes ſhould be diſtinguiſhed from the ſtarch; ſince the one is an approximation of the conſtituent parts, in conſequence of the evaporation of the aqueous fluid, whilſt the other is one of the principles formed by vegetation, and very eaſily ſeparable, provided theſe roots have not undergone the action of fire.

The flour of Potatoes may be long kept without alteration; it needs only to be ſufficiently dried, and to be ſecured from moiſture, and the deſtructive animals which it allures: it appeared to me quite as good, after a year had elapſed, as the

firſt day of its preparation; nor could I ever perceive any appearances of germination, at the return of ſpring, or that it changed colour, as ſome have advanced, with a view, no doubt, of depreciating ſuch kind of food.

It would be infinitely more expeditious to dry the Potatoes whole; but I have long ſince learned from experience, that however ſmall they happened to be, it is impoſſible to diſſipate the whole of the watery principle; they become ſoft, and ſpoil, ſooner than part with the remaining moiſture, which prevents their being reduced to powder. I have often expoſed Potatoes to a heat of 100—120°, in order to prevent them from ſhooting or ſprouting; this method effectually deprives them of this faculty, but at the ſame time greatly injures the organization; theſe roots, half dried, are not ſo delicate when boiled, and they cannot be long kept without ſuffering internally.

As it is very difficult to clean Potatoes, on account of their inequality, and to peel them raw, unleſs they have been ſoaked for ſome time in water; the ſmootheſt may be ſelected for this purpoſe, and the ſkin may be taken off at the time of gathering: women and children may be charged with this taſk.

I MUST however obſerve, that whatever care may be taken in culling, cleaning, drying, and grinding Potatoes, neither the coarſe meal nor the flour can ever be brought to poſſeſs every advantage; however you may prepare them, you muſt not expect to have an aliment under this form as pleaſant as it is wholeſome; what a difference, when they are boiled before they are dried! Two products are obtained, which have nothing in common but the ſame ſource.

Of the Salep of Potatoes.

THE bulbous roots of the family of orchis, when they have been boiled, clean-

ed,

ed, dried, and reduced to powder, receive the name of ſalep; the uſe of this ſubſtance is well known, when we wiſh to procure a ſubſtantial and eaſily digeſtible nouriſhment. The Potatoe, ſubjected to the ſame preparation, reſembles it ſo ſtrongly, that it may not only be ſubſtituted in its ſtead on many occaſions, but likewiſe, in caſe of want, ſupply the place of the freſh roots, till the next crop is ripe.

When Potatoes are nearly boiled, take them from the fire; peel, ſlice, and ſet them in or upon an oven after the bread has been drawn; in thirty hours they will be dried enough, and will have loſt $\frac{3}{4}$ of their weight.

The trouble of ſlicing them, eſpecially when it is propoſed to reduce them to powder, may be avoided, by making the above-mentioned pulp, and ſpreading it in thin beds in a ſtove; but they ſhould

be boiled and reduced to pulp only as they are dried, leſt they ſhould turn ſour.

The Potatoe, by being boiled, ſliced, and dried, acquires the tranſparency and hardneſs of horn; it breaks ſhort, and the fracture is ſomewhat like that of glaſs; it does not attract the moiſture of the atmoſphere, is pounded with difficulty, and affords a dry whitiſh powder, reſembling that of gum arabic: this powder diſſolves in the mouth, and with water forms a mucilage. Such are the general properties of ſalep.

In Switzerland and Alſatia, an inſtrument contrived on purpoſe for breaking Potatoes has been uſed with advantage; it conſiſts of a cylindrical pipe, pierced at the bottom with a number of ſmall holes, like a ſkimmer, through which the Potatoes are forced, after they have been peeled, dried ſlowly, and boiled: thus a kind of vermicelli is formed; hence the Genoeſe and Italian paſtes may be imitated,

by

by mixing the powder of Potatoes with the pulp, and adding the uſual ſeaſoning. This mixture is eaſily hardened, and ſwells very well in hot water.

If the obſervations of Ellis and Magellan, on the antiſcorbutic virtue of Potatoes, ſhould be confirmed by further experiments; if this virtue, as there is every reaſon to believe, reſides in the extractive matter; theſe roots, which have loſt nothing by being boiled and dried, will be more efficacious in this diſeaſe than the bread and biſcuit, that have been deprived in part of their extractive matter: they will have over freſh Potatoes the advantages of occupying leſs room, of being laid up any where, of keeping longer, and of becoming, in a moment's boiling, a wholeſome and mild food, comparable to that of the Potatoe itſelf. The pulp uſed for making the bread, may be prepared in the moſt dead ſeaſon of the year; and this would be a ſure mean of having theſe

roots

roots for food when they can no longer be had in ſubſtance.

Potatoes in ſalep do not, like the meal, alter the whiteneſs of wheaten bread when they form a part of it, or different jellies or broths; they preſerve their colour, taſte, and ſmell, becauſe the extractive matter is confounded with the ſtarch and parenchyma by boiling; whereas ſimple deſiccation acts on each of theſe principles ſeparately, and cauſes an alteration, which makes dried Potatoes ſo much inferior to thoſe that have undergone a previous boiling.

When this ſalep is to be adminiſtered, it ſhould firſt be reduced to a fine powder; an ounce of it ſhould be boiled in an half-pint of water, for a quarter of an hour, and then paſſed through a cloth; a little ſugar and cinnamon ſhould be added: when it grows cold, it becomes a whitiſh kind of jelly, and ſhould be given every two hours, in the doſe of one or two ſpoon-

fuls, according as the caſe requires. When it is propoſed to make a mucilaginous ptiſan, like rice or barley-water, the ſame quantity of ſalep may be diluted in a quart or three pints of water; it may be made pleaſant by any ſyrup ſuited to the diſeaſe.

Here it will be objected, that my new ſalep is nothing but Potatoes, of which the different principles have been approximated by the evaporation of the exceſſive moiſture; and that it cannot be conſidered as ſimilar to a bulbous root, in which mucilage is extremely attenuated. I reply, that the boiling produces in the Potatoe a mucilage, on which the drying afterwards acts, by deſtroying the viſcidity, and bringing it to the ſtate of jelly. Beſides, I have given it with advantage, in caſes where ſalep was indicated, in bilious cholics, in diarrhœas, and in all diſeaſes depending on acrimony of the lymph. But I do not wiſh to dogmatize in medicine, or to rob the rich of their ſalep,

which

which coſts them 20 francs a pound: the expence of mine will be very trifling; and I may ſurely be allowed to call it the ſalep of the poor.

Of Sago of Potatoes.

Sago is well known to be a feculency, ſeparated by ſearces, and waſhed from the farinaceous pith contained in certain palms, very common in the Molucca iſlands. This feculency, which is not ſoluble in water unleſs it boils, which then increaſes conſiderably in bulk, and changes into a tranſparent jelly, is nothing but real ſtarch. Now, as I think I have proved that this ſubſtance is identical, like ſugar, in whatever body it may happen to be contained, the ſtarch of Potatoes may ſupply its place entirely.

The form of ſmall grains, in which ſago is imported, and the reddiſh colour, are occaſioned by the degree of heat employed by the Indians for drying it. The

way

way to extract the ſtarch from Potatoes has been already ſhewn; it would be poſſible to bring it to a perfect reſemblance with ſago, if it could be ſuppoſed that drying, carried to a great length, could at all influence its œconomical properties.

When ſago of Potatoes is to be uſed, put a ſpoonful in a ſaucepan, and add gradually a pint of water, or milk; it ſhould be ſet to boil over a ſlow fire, and ſtirred conſtantly for half an hour; ſugar and aromatics may be added.

How many ſtomachs, naturally weak, or enfeebled by exceſs or diſeaſe, and incapable of digeſting ſolid food, would be relieved and even cured by the uſe of ſalep and ſago of Potatoes? Each affords a wholeſome nutriment, eaſy of digeſtion, and adapted to fulfil the ſame indications as ſalep and ſago properly ſo called. They are reſtoratives for convaleſcents, old perſons, and children. The Tapioca of the Americans, which is nothing but the

whiteſt and pureſt ſtarch of the magnoe, affords excellent and very wholeſome broths for debilitated and conſumptive patients.

Potatoes, I repeat it, may ſupply the place of ſalep and ſago, in times of plenty; two ſubſtances imported from very diſtant countries, and on that account liable to be ſuſpected of improper mixtures. If they are ſpecifics for our diſeaſes, their exorbitant price prevents the poor from profiting by them. The ſubſtitutes here propoſed will coſt almoſt nothing: four pounds of Potatoes afford one pound of ſalep; and ſix pounds, one of ſago.

Shall we for ever lay the two Indies under contribution to ſatisfy our principal wants, and value only what is imported from far, and has the merit of growing in another hemiſphere?

CHAPTER

CHAPTER VII.

OF THOSE FARINACEOUS SEEDS AND ROOTS FROM WHICH IT IS NECESSARY TO EXTRACT THE STARCH.

IT has been long a prevailing opinion, that ſeeds belonging to the great family of graſſes, were the only receptacle of ſtarch: but it cannot now be doubted, that it is to be found in pulſe, and in a great number of other ſeeds and roots belonging to various claſſes. I would almoſt venture to alledge, that there is no part of fructification in which it is not contained; that it is identical, from whatever ſubſtance it is extracted; and that the ſtarch of ſeeds is not more attenuated than the ſtarch of roots.

IT ſeems to me that berries and ſtone fruits cannot contain ſtarch, becauſe their pulp is too ſoft to hold and ſupport a ſolid body:

body: but my conjectures reſpecting apples, and other like fruits, were very different; for, as they are firmer, they may well ſerve ſuch purpoſes: but my enquiries made with this view, were fruitleſs. M. Duval alſo ſuſpected the ſame thing, in conſequence of ſome experiments more ſucceſsful than mine. We tried together, whether his ſuſpicion was well founded, and we actually found ſtarch in ſome ſweetiſh cyder-apples, whilſt others of a ſourer taſte did not afford an atom.

Starch then is contained not only in roots, bark, ſtalks, and ſeeds, but in fruits likewiſe: there remain only leaves and flowers, and I would not aſſert that it may not be found ſometimes in them; and the rather, as I have examined, and obtained from ſeveral of them a mucilage nearly reſembling it: then it may be ſaid, that all the organs of plants are proper for the formation of ſtarch as well as of ſugar, two ſubſtances differing in their nature and properties.

As

As moſt of the following ſeeds and roots have never been thought to contain any alimentary principle, becauſe it was not known that they contained ſtarch; that ſtarch was the eſſential part of farinaceous ſubſtances; and that it may be ſeparated from the other parts, and reduced to the form of bread; they have always been ranked among poiſonous ſubſtances: in which medicine has ſought ſpecifics, and the arts reſources, which have not always been confirmed by obſervation and experiment.

As the extraction of the ſtarch, and the way to mix it with a glutinous matter, in order to make real bread, by the help of fermentation and baking, have been deſcribed at great length already; it will be ſufficient to recapitulate the moſt eſſential part here.

TAKE any of the following roots, when ripe, ſtrip them of their ſkin, divide them by a grater, pour water on the grated maſs,

which, as it paſſes through a cloſe ſearce, will carry along with it a matter that will depoſit itſelf gradually at the bottom of the wooden or earthen veſſel ſet to receive it: after ſome time, pour off the liquor, and waſh the depoſited matter repeatedly with freſh water, till it becomes perfectly inſipid; then expoſe it to the moſt gentle heat; as it becomes dry, it turns white, and preſents a friable matter, without colour, taſte, or ſmell, exhibiting all the characters that diſtinguiſh ſtarch.

Of all the plants mentioned below, the root, or its bark, are the only parts proper for the object in view: it ſhould be gathered in autumn, ſhould be choſen freſh and ſucculent, cleared from its hairy filaments and its coloured coats; it ſhould alſo be cleaned and waſhed till the water appears quite tranſparent and colourleſs.

As all the bitterneſs of the horſe-cheſnut, the aſperity of the acorn, the cauſticity of the arum and ranunculuſes, the burning

acrimony

acrimony of the bryony, &c. remain in the water employed to ſeparate and waſh the ſtarch, it is proper to uſe wooden inſtruments to ſtir the mixture, as the hands might ſuffer.

The ſtarch ſeparated from the ſeeds and roots mentioned below, when well waſhed and dried, is perfectly identical: but it is not ſufficient to ſeparate it from the ſubſtance in which it is contained; it is moreover requiſite to give directions how to convert it into food. It may be introduced, either alone or mixed with the pulp of Potatoes, into the dough of various grains, to make an addition to the quantity of bread. Bread may be made without flour of any kind, by the proceſs deſcribed above; but if the Potatoe ſhould alſo fail, the pulpous fruits of the cucurbitaceous family, ſuch as the pumpkin, which are ſometimes added to wheaten dough in various proportions, may be ſubſtituted: laſtly, ſhould every other re-

ſource fail, the ſtarch repreſenting flour would ſtill ſerve for food; it would be ſufficient to dilute it in ſome vehicle, in order to obtain a very nutritious broth or jelly.

I HAVE uſed the ſeveral ſtarches extracted from the following plants, without diſtinction, nor was it poſſible to tell from which it had been procured: when there is a ſlight difference perceptible in the taſte, ſmell, or colour, it ſhould be attributed to the number of waſhings rather than to any eſſential difference of nature.

The Horſe-Cheſnut *.

The Acorn.

[THE roots only of the following vegetables afford ſtarch in conſiderable quantity.]

* This is not an indigenous tree of this country, nor very often to be found in it. In France there are whole foreſts of it.

Common Burdock,	Arctium Lappa.
Deadly Nightſhade,	Atropa Belladonna.
Biſtort Snakeweed,	Polygonum Biſtorta.
White Bryony,	Bryonia alba.
Meadow Saffron,	Colchicum autumnale.
Meadow-ſweet,	Spiræa filipendula
Maſterwort,	Imperatoria Oſtruthium.
Black Henbane,	Hyoſcyamus niger.
Pimpernel-leaved Dropwort, -	Œnanthe Pimpinelloides.
Obtuſe-leaved Dock,	Rumex obtuſifolius.
Sharp-leaved Dock,	Rumex acutus.
Water-Dock,	Rumex { Aquaticus an Britannica ?
Wake Robin,	Arum maculatum.
Bulbous Crowfoot,	Ranunculus bulboſus.
Knotted Figwort,	Scrophularia nodoſa.
Dwarf Elder,	Sambucus ebulus.
Common Elder,	Sambucus nigra.
Common Flag,	Iris pſeudacorus.
Stinking Flag,	Iris fœtidiſſima.

CHAPTER VIII.

A LIST OF SUCH FARINACEOUS SEEDS AND ROOTS AS MAY BE USED ENTIRE FOR FOOD.

ALL the parts of plants have a particular ſeaſon in which they may be gathered in their higheſt perfection: fruits and ſeeds have generally no fixed period, but it is neceſſary to wait till they are quite ripe: as to roots, opinions are yet divided with reſpect to the time of gathering them: they are indeed ſucculent in ſpring; but it may at the ſame time be remarked, that the liquid vehicle which then abounds, having not undergone a ſufficient elaboration, is rather watery than mucilaginous; that part of this vehicle ſhould acquire nutritive properties; and that theſe advantages cannot be had together, except at the decay or fall of the leaves: this conſideration alone ſhould make us give the preference

preference to the opinion of thoſe who maintain that roots ſhould be gathered in autumn.

But if it is neceſſary to wait for this ſeaſon, in order to collect the roots of the uncultivated plants to be mentioned below, how can they be diſtinguiſhed, ſince at this time the leaves, which may ſerve to point them out, are either withered or fallen? Moſt of them may be gathered before their complete maturity. Beſides, it is of ſmall conſequence whether they poſſeſs the whole quantity of ſtarch which they have in autumn; the circumſtances in which it is propoſed to have recourſe to them admitting of no delay.

It may be added, that the farinaceous roots of perennial wild plants do not acquire their qualities, conſiſtence, and bulk, in the ſpace of a ſingle year; ſome require a period of five or ſix years to arrive at their entire perfection: it is evident, that in this caſe they will afford much more

ſtarch; which afterwards decreaſes as their fleſhy ſtate decays, and as they approach that period of old-age when they aſſume the conſiſtence of woody fibres. All theſe reaſons, deduced from experiment and obſervation, may ſerve as a proof that it is impoſſible to aſcertain the quantity of ſtarch that may be extracted from a given weight, and conſequently the price of the food obtained from them: famine never calculates; and in times of ſcarcity, gold has ſcarce any value in compariſon of bread.

If the ſtarch contained in the ſeeds and roots of wild vegetables was always attended with poiſonous juices or pulp, I ſhould certainly continue to propoſe the extraction of it, in the way already deſcribed, becauſe hitherto no better method of applying theſe plants to the purpoſes of food has been diſcovered; but happily there are alſo uncultivated plants, in which the ſeveral principles are as mild as ſtarch, and which may be uſed for food without

without ſeparating it. It is of importance to avoid loſs when plenty fails, and advantage muſt be taken of every thing, in order to have neceſſaries. I only regret that ſuch plants are leſs numerous and common than the others.

Wall Barley,	Hordeum murinum.
Cock's-foot Panick-graſs, - -	Panicum Dactylon.
Wild Oat-graſs,	Avena fatua.
Tall Oat-graſs,	Avena elatior.
Floating Feſcue-graſs,	Feſtuca fluitans.
Annual Darnel-graſs,	Lolium temulentum.

[The ſeeds of this graſs ſhould be expoſed to the heat of an oven before they are taken to the mill; the bread ſhould be well baked, and ſhould not be eaten before it is cold. Theſe ſimple precautions ought always to be obſerved when new grain is uſed; they would be the means of preventing the diſorders ſo often prevailing in autumn, of which the real cauſe is frequently unknown.]

Field Broomgraſs, Bromus ſecalinus.

[The ſame precautions are neceſſary to be taken with the ſeeds of this graſs as with thoſe of the preceding.]

Cow Wheat, Melampyrum arvenſe.
Cock's-comb, Rhinanthus criſtagalli.
Hare's-foot, Trifolium arvenſe.
Corn Spurrey, Spergula arvenſis.
Knot-graſs, Polygonum aviculare.
Snakeweed, Polygonum convolvulus.
Corn Cockle, Agroſtemma Githago.

THE SEEDS of the foregoing may be uſed for food, but it is from the ROOTS of the following plants that we are to derive the ſame advantage.

Heath peaſe, Orobus tuberoſus.

[The root and ſeeds may be uſed for food.]

Wild Carrot, Daucus Carota.

Hare-bells, Hyacinthus non-ſcriptus.

[The roots of this plant are ſaid by ſome to

to have a poiſonous quality, when newly gathered.]

Wild Parſnep,	Paſtinaca ſylveſtris.
Pignut,	Bunium bulbo-caſtanum.

CHAPTER IX.

A LIST OF WILD PLANTS, OF WHICH THE ROOTS MAY BE SUBSTITUTED IN THE PLACE OF POT-HERBS.

WILD Celery,	Apium paluſtre.
Silver-weed,	Potentilla anſerina.
Canterbury-bells,	Campanula trachelium.
Milk-thiſtle,	Carduus marianus.
Globe-thiſtle,	Carduus eriophorius.
Marſh-thiſtle,	Carduus paluſtris.
Wild Succory	Cichorium intybus.
Common Comfrey,	Symphitum officinale.
Alexanders	Smyrnium olufatrum.
White Water-lily,	Nymphæa alba.
Female Orchis,	Orchis morio.
Male Orchis,	Orchis maſcula.

Man

Man Orchis,	Orchis militaris.
Broad-leaved Orchis,	Orchis latifolia.
Pyramidal Orchis,	Orchis pyramidalis
Yellow Bethlem-ſtar,	Ornithogalum luteum.

Let it not appear ſurprizing, that among the ſeaſonings which uncultivated vegetables are capable of affording, I do not enumerate any ſpecies of Fungus, though they all grow ſpontaneouſly on the hills, and in the woods and plains. Moſt of theſe ſingular plants contain a poiſon of great activity; and, unhappily, we are deficient both in chemical and botanical means to eſtabliſh certain marks of diſtinction between them, which may ſerve to characterize their effects, and at the ſame time prevent the fatal miſtakes every day made in chooſing them: it would then be better, as Geoffroy expreſſes it, to return muſhrooms reared in beds to the dunghill whence they ſprung.

Were it even in our power to render all muſhrooms innocent by any particular operation, experience proves that the beſt

ſorts,

ſorts, thoſe uſually introduced into our ragouts, may become highly dangerous, either becauſe they have been gathered too early or too late, or in a bad ſeaſon; or from having been expoſed for a long time to fogs, the dew or the vapour of any putrefying ſubſtance; or laſtly, by eating to exceſs, or from the habit of body at the time of eating. M. DE JUSSIEU has told me, that both he and his uncles were well perſuaded that all muſhrooms were ſuſpicious. What more reſpectable authority in botany can I quote in behalf of my opinion? How many accidents, that have happened immediately after meals, have been attributed to cauſes totally different, while they were occaſioned by an immoderate uſe of muſhrooms?

IT would be in vain to hope that a ſketch of the horrible but too certain picture of the victims daily ſacrificed by muſhrooms, would induce men to abandon them; gluttony would ſtill prevail, and, though the moſt ſtriking inſtances

warn

warn us every moment of the poiſonous principle contained in fungous plants, their reputation has not ſuffered, but we continue to eat them with equal pleaſure and ſecurity. Hence, ſince on this occaſion calamity has not rendered us wiſer, I will point out with ſorrow and reluctance ſome means of preventing or diminiſhing the accidents which ariſe from this ſource.

THERE ſhould always be an interval between the gathering and eating of muſhrooms, during which they ſhould be ſoaked in cold water, and then blanched in freſh water; and wine, vinegar, lemon-juice, or acidulous plants, ſhould be mixed with the diſhes in which they are uſed. Laſtly, it is of the higheſt importance to chew them well, leſt the property belonging to ſeveral ſorts, of ſwelling in the ſtomach, ſhould give riſe to enormous pieces, which would be pernicious ſolely on account of their indigeſtible bulk.

MUSHROOMS, I repeat it, are not nutritious;

tritious; they only contain a ſavoury ſubſtance, which may eaſily be diſpenſed with; and, ſince there is no way to diſtinguiſh the muſhroom which is eſſentially poiſonous, from that which may be rendered poiſonous by a thouſand accidents, let us not heſitate to proſcribe it from the claſs of ſeaſonings, by ſubſtituting the heart of artichokes, celery, and the root of parſley, and other garden plants; in which it would be eaſy, on enquiry, to diſcover the ſeducing reliſh of the deceitful muſhroom.

CHAPTER X.

TO MAKE A LIQUOR WHICH MAY BE SUBSTITUTED IN THE PLACE OF BEER.

IN order to obtain liquor which may be ſubſtituted in the place of beer, take rye or wheaten bran, and boil it in ſoft water;

water; then ſtrain it, and fill a barrel with it; afterwards diffuſe a leaven, eight days old, in it, and, if the weather is hot, fermentation will take place in leſs than twenty-four hours; as ſoon as the foam that ariſes through the bung-hole begins to ſink, ſtop it up carefully, and let the liquor reſt for ſome days, that it may become clear. When the bran has been hindered from acquiring any bad taſte, this liquor is pleaſant enough, has a vinous and acidulous taſte; it is, in ſhort, the lemonade of the poor inhabitants of the country.

So eaſily is water made to acquire vinous properties, and to quench thirſt, that we need not rob the cattle of their bran; a little honey or ſugar, a few ſaccharine roots diluted in a good deal of water, will ſuffice.

FINIS.